Note too the statements at the bottom of page 12 with respect to equation (3), and then equation (4), where "d" is the distance between optical energy source and camera or sensor:

"Given that the geometry of the source and the camera is known" (emphasis added), *Y* is given as follows:

$$Y = (-Z \tan \alpha + d) \qquad \text{(Equation 3)}$$

Replacing Y in Equation 2:

$$Z = \frac{\frac{f}{P_Y} d}{1 + \frac{f}{P_Y} \tan \alpha} \qquad \text{(Equation 4)}$$

In short, there is indeed support in the Specification for the objected-to language "using a priori positional relationship between said optical energy source and said sensor", which is to say value "d" in equations (3) and (4). As to the remaining language in the claims, it is self evident that the claimed invention functions "without requiring a priori positional knowledge of said object". If positional knowledge of the object were known a priori, there would be no need for the invention.

In view of the above remarks and citations to the Specification, the 35 USC §112, ¶1 rejection must be withdrawn.

B. The 35 USC 102(b) Rejection of Claims 1, 2, 5, 6, and 13:

Claims 1, 2, 5, 6, and 13 were rejected as being anticipated by USP 4,541,722 to Jenks. As to claim 1, the Examiner assets that Jenks discloses a contour lines scanner to determine widthwise position and shape of board faces. The Examiner asserts that Jenks' lasers (42) generate optical energy for at least one fan light beam (44) used to define a reference plane in space. Jenks disposes a TV camera (56) as a sensor at a known vertical position relative to the reference plane defined by laser beams (44), the sensor having a field of view that encompasses at least an intersection of object (12). Jenks' system also includes a microcomputer (64) to recognize an object intersection in output from camera (56). The Examiner asserts the microcomputer (64) determines occupancy of the space by calculating a shape from the contours lines that would inherently include the size of the intersection, and also a widthwise position as a relative location of the intersection. The Examiner goes on to state the according to Jenks, occupancy is determined with lasers (42) located horizontally from board (12), which camera (56) is located above the plane corresponding to beams (44), produced by lasers (42). The Examiner states that in the Jenks invention, it does not matter where board (12) is located within the reference plane.

As Applicants will now demonstrate, the Jenks reference cannot function as the Examiner has described to estimate the volume of an object (or in Jenks, the "cant"). Applicants note that Jenks' teaching is intended to identify saw lines (sawlings) to maximize the total value of lumber to be cut (col. 8, lines 5-10). Jenks most certainly does not and indeed cannot estimate the size of an arbitrary object, as is demonstrated below with reference to Fig. A, which is a representation of the Jenks invention.

In Fig. A, Jenks' top camera detects images of contour lines generated by multiple laser lights, disposed at specified vertical heights relative not to the camera, but relative to the cant base. As will now be shown with reference to Fig. A, Jenks simply cannot estimate the volume of an object.

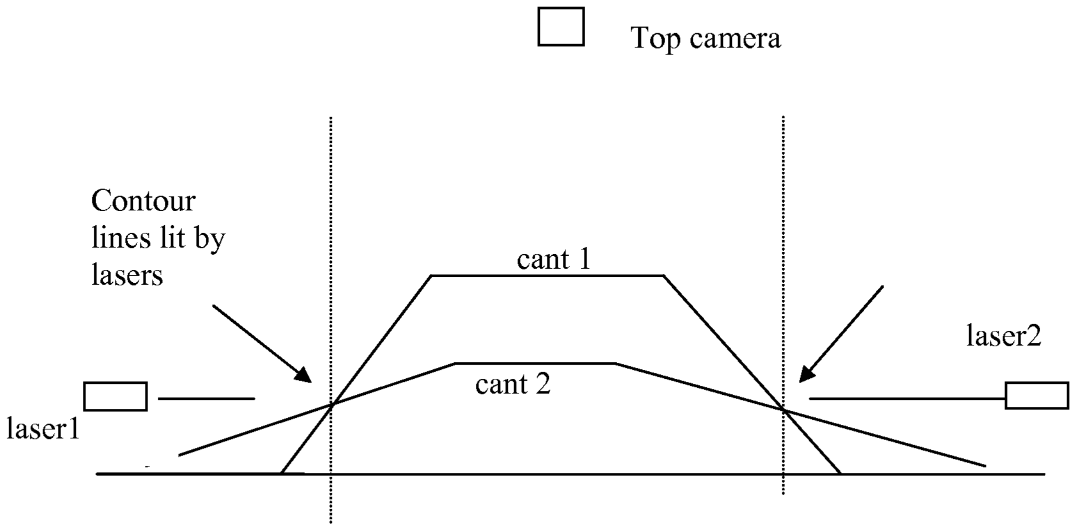

FIG. A --- A System According to Jenks '722

In a Jenks system as shown in Fig. A, all that is required that that the top camera point downwardly normal to the plane of the beam (or object), Jenks '722, col. 6, lines 66-68. As such, Jenks' camera is not disposed at a predetermined position with respect to his light source. Indeed, Jenks proposes multiple cameras disposed around the cant, apparently to acquire better contour lines. Note that Jenks' top camera cannot distinguish between laser lines for cant 1 and cant 2.

Thus, Jenks cannot distinguish between a volume associated with cant 1 from a volume associated with cant 2 because the volume of each would appear identical to Jenks' system. Stated differently, Jenks cannot be used to determine occupancy by calculating a shape, a size of an intersection, and a relative location of an intersection in a space of interest.

Because Jenks does not specify disposing his camera at a position specified relative to the source of his laser light, Jenks cannot use triangulation to estimate the volume of an object. Applicants respectfully point out that Jenks is silent as to camera focal length f, a parameter that is necessary in a triangulation calculation. This omission is not surprising, however, because Jenks simply is not concerned with estimating object volume, which is understandable because Jenks cannot estimate volume.

In short, Applicants respectfully submit that Jenks does not disclose or suggest a system whose sensor is disposed at a known vertical position relative to a reference plane defined by a fan beam of light, which system can determine "occupancy" of a space by "calculating a shape", "a size", and a "relative location" of an intersection within the space of interest, such that "occupancy within said space is determinable using a priori positional relationship. As such, Jenks fails to disclose every element recited in claims 1, 2, 5, 6, and 13, and must be withdrawn as a 35 USC §102(b) reference against these claims.

C. 35 USC §103 Rejections as to Claims 3, 4, 7-10:

Claims 3, 4, and 7-10 were rejected as being obvious and unpatentable over Jenks '722 in view of USP 5,102,233 to Uesugi. As to Jenks' inability to determine object volumes, Applicants refer to their remarks above at paragraph B. herein. In short, Jenks simply does not function as interpreted by the Examiner.

As to Uesugi, Applicants note that Uesugi passes a scanning slit light (col. 2, line 54) over a curved object. As such, because his light source is moving, in Uesugi the positional relationship between his light source and his sensor cannot be known a priori. By contrast, Applicant uses a fixed light source whose positional relationship to a sensor is an "a priori positional relationship". Applicant's claims can further recognize form "an output" of the sensor the information needed to calculate shape intersection, intersection size, and relative location of an intersection in the relevant space (see claim 1, claim 13). By contrast, Uesugi requires not one image but "successive video signals" to function (col. 15, lines 45-46, col. 16, lines 37-38, col. 18, lines 67-68). In further contrast to what is claimed by Applicant, Uesugi appears to use a predefined angle of incidence (θ) between his scanning light source and reference plane, e.g., table where the object to be measured is place (see Uesui Fig. 4A, and col. 5, line 48). In contrast, Aplicant's claimed invention functions without a "resting" type reference plane, and instead uses a plane generated by a fan beam of light whose position is fixed and known a priori relative to the sensor.

In further difference, Applicants point out that in Uesugi, the curved surface is predefined as z=f(x,y), see col. 5, line 62. As such, Uesugi cannot calculate real world dimensions or size of his surface as there is no known relationship concerning his camera and light source. If for example his shape has a triangular cross-section, Uesugi cannot determine whether it is 1 cm tall, 1 m tall, 10 m tall, etc. By contrast, as claimed by Applicant, space occupancy is determinable as noted above.

Thus Applicants respectfully submit that combining what is described or suggested by a proper reading of Jenks ‘722, with what is described or suggested by Uesugi ‘223, assuming such a combination were even feasible, would still not arrive at what Applicant is claiming. In short, claims 3, 4, 7-10 are patentable over these references, individually or in combination.

D. 35 USC §103 Rejection of Claims 14-20:

Claims 14-20 were rejected as being obvious and unpatentable over Jenks ‘722. Applicants respectfully refer the Examiner to their analysis of Jenks ‘722 set forth at paragraph B herein. As noted therein, among other differences from the claims 14-20, Jenks cannot determine “occupancy of the space by calculating a shape from the contour lines ….” as urged by the Examiner at the bottom of page 6 of the pending final Office Action. For the reasons set forth at paragraph B herein, Applicants submit that claims 14-20 are not obvious and are patentable over Jenks ‘722.

E. 35 USC §103 Rejection of Claims 11 and 12:

The Examiner urges that claims 11 and 12, which depend from claim 1, are obvious and not patentable over Jenks ‘722 in view of USP 5,381,235 to Inoue. Applicants respectfully refer to their analyses of Jenks ‘722 at paragraph B herein. Inoue is cited as disclosing a three-dimensional device using a single image sensor to detect images. But given a Jenks system, merely replacing Jenks’ sensor with an Inoue type sensor would still not overcome the deficiencies noted at paragraph B herein for a Jenks system. The resultant system, assuming a combination of Jenks/Inoue were feasible, still could not calculate volumes for the reasons set forth at paragraph B. Further, in such a combination, a Jenks/Inoue sensor still would not be "disposed in known registration relative to location of said source of optical energy", as called for in claim 11.

Thus, a combination of what is described or suggested in Jenks with what is described or suggested in Inoue, assuming such combination were even feasible, still would not yield what is provided by claims 11 and 12.

Applicants submit that claims 11 and 12 are patentable over Jenks and/or Inoue.

* * * * *

Applicants submit that this Amendment should be entered. Further, as each of the pending claims is in patentable form and is neither anticipated nor rendered obvious by the references of record, claims 1-20 should be passed to allowance at this time.

CONCLUSION

It is Applicant's belief that this Amendment places the application in condition for allowance. Applicants request entry of the amendment and issuance of a Notice of Allowance. The Office is given permission to charge any unpaid fees to Applicants' deposit account (50-1914).

Respectfully submitted,

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